Conclusions: Moddicom will be freely available for the community in the next spring. Hopefully the use of this tool will allow to share (and tune) a large set of functions available for modeling purposes in the scientific community.

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Contouring bowel loops on daily MVCTs: assessing inter-observer variations and the impact on DVHS

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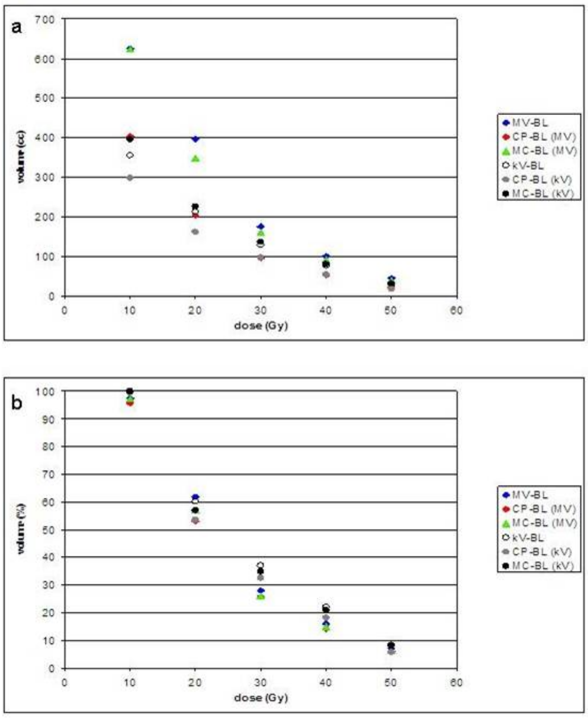
Purpose/Objective: The bowel may display complex motion patterns during RT. This is a likely contributor to the relatively weak relations between bowel doses and toxicity. To enable studies of motion-inclusive dose response relations of the bowel, contour propagation methods may play an important role as a supplement or possibly an alternative to manual delineation. This study aimed to assess the inter-observer variations in contouring bowel loops (BLs) as well as their impact on dose/volume parameters, as a benchmark for comparison with the performance of a commercial contour propagation software.

Materials and Methods: Four observers contoured BLs on both the planning kV-CT (kV-BLs) and on a therapy MV-CT (MV-BLs) in eight patients treated with helical tomotherapy. After elastic registration, the kV-BLs were also propagated (CP-BLs) to the MV-CT by using a commercial software (MimVista). Subsequently these propagated contours were manually corrected (MC-BLs). The inter-observer variations and agreement between both CP-BLs and MC-BLs relative to the MV-BLs were quantified using the DICE index. Contouring time was also compared. To evaluate the impact of inter/intra-observer variations on DVH parameters, a tomotherapy plan was simulated for each patient (60 Gy to prostate and seminal vesicles, 52.5 Gy to lymph nodes); absolute and relative DVHs were compared (V10-V50Gy). Finally, to further evaluate BL propagation on MV-CTs, results were compared against BL propagation to kV-CTs by repeating the same procedure on two additional patients with both planning kV-CT and therapy kV-CT available.

Results: The mean DICE index between the observers were 0.89 for kV-BLs, 0.82 for MV-BLs and 0.92 for the reference therapy kV-CT, with significant inter-modality differences (Wilcoxon test, $p<0.002$). Contour propagation alone generally failed, with an average DICE between propagated and manual BLs on MV-CTs/kV-CTs of 0.56/0.65, missing a large part of the BL volume due to the poor local contrast between BLs and pelvic fat and the difficulties of recognising changes in air content between different images. After manual correction, DICE values were satisfactory, increasing to 0.81 for MV-CTs and 0.90 for kV-CT while reducing contouring time with on average 48%. Regarding the impact on DVHs, significant differences ($p<0.05$) were found between CP-BLs and manual BLs for absolute (V10-V50) but not for relative volumes, while a very good agreement was generally found for MC-BLs.

Figure Mean values of DVH parameters (V10-V50) absolute (a) and relative (b) for all the delineated BL structures.



Conclusions: The visibility of the bowel on MV-CT was reasonably good in most of the pelvic cavity indicating that MV-CTs has potential for quantifying bowel motion during RT. Inter-observer variation was satisfactory although lower than in kV-CT. The use of commercial software to propagate bowel contours from kV-CT to MV-CT followed by manual correction does not influence the resulting DVHs for the bowel loops and may replace full manual contouring.

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Cumulated dose prediction

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Purpose/Objective: A lot of effort is put into diminishing the CTV-PTV margin in order to spare normal structures adjacent to PTV. The purpose of this work was to test the hypothesis that the mean dose distribution calculated from a few first fractions is a good estimate of the cumulated dose distribution, representing the whole treatment.

Materials and Methods: For 25 patients with prostate cancer treated in our clinic orthogonal portal images were taken daily during the entire treatment (25 fractions, 2.6Gy fraction dose). Set-up errors in three directions were recorded. For each patient three treatment plans were prepared: 3D-CRT, 5 fields IMRT plan and two arcs VMAT. For each treatment technique and each fraction the dose